

0.0 Executive Summary

This report studied three alternatives for each of two demographic years producing six sets of traffic patterns. The three alternatives are Eastern Alternative, Eastern Bypass, and the Evangeline Thruway RR-4 Alternative as drawn on the attached map. The two demographic years are the 2000 census data set supplemented by local surveys and the 2012 projected data set. The traffic figures generated by these three alternatives and two demographic years were compared with existing conditions in Table 6.0 on page 6. The comparison seeks to determine which alternative is the most efficient in terms of certain modeling characteristics.¹

This data permits the following conclusions to be drawn:

- (1) The most efficient proposed facility for the 2000 demographic year is the Evangeline Thruway RR-4 Alternative.
- (2) The most efficient proposed facility for the 2012 demographic year is the Evangeline Thruway RR-4 Alternative.
- (3) The amount of 2000 and 2012 trips on the facilities decreases from the westernmost alignment (Evangeline Thruway RR-4 Alternative) to the easternmost alignment (Eastern Bypass).
- (4) The demographic growth between 2000 and 2012 does not significantly increase the traffic demand for the Eastern Alternative and the Eastern Bypass. However, the traffic demand is slightly more for the RR-4 Alternative.

1.0 Networks and Alternative Alignments

There are two primary networks used in this report. The first is the existing network as constructed in the year 2000. The second network is the Financially Constrained Transportation Network (FCTP) as approved by the Lafayette Metropolitan Planning Organization (MPO). These primary networks are modified by introducing various improvements in the form of alternative alignments for the I-49 Connector.

¹ A more efficient alternative is one which is thought to carry more traffic without increasing network VMT and VHT and/or to move more MADT on the comparable roadway segments as further discussed in relation to Table 6.0.

1.1 Networks

The first primary network is the year 2000 existing network. The year 2000 existing network has transportation network roadways present in the year 2000 for Lafayette Parish. The reason we are using the 2000 year network is that it matches our 2000 census demographic data. The network is balanced in that it has a linear correlation coefficient of $+0.96^2$ between existing and modeled traffic patterns. This level of accuracy is above the standard used by the Federal Highway Administration of $+0.88$.³ The network is the result our staff's work and represents many hundred of hours of data collection, verification and data checking as well as analysis over a three year period.

The second primary network is the Financially Constrained Transportation Network (FCTP). This network contains the projects for which the Lafayette MPO has approved transportation expenditures for a 20 year period as projected forward from 1995. We are in the process of developing a major update of the FCTP as part of an extensive traffic modeling study now underway.

1.2 Alternative Alignments

The two primary transportation networks are modified to create three specialized networks: the Interstate 49 (I-49) Eastern Alignment, the I-49 Eastern Bypass, and the Evangeline Thruway RR-4 Alternative. These alternatives are shown on the attached drawing, North South Corridor Alignments (dated 12/24/02).

The three alignments are described in the 1993 *Lafayette North-South Corridor Study*⁴. The 1993 Corridor Study contains five alternatives including a No Build Alternative. During the early phases of the I-49 planning process, four alternatives were rejected: Western Bypass (Alternative No. 1), Eastern Alignment (Alternative No. 2), Eastern Bypass (Alternative No. 4) and the No Build

² Technically, this value is the result of a regression analysis in which the linear correlation coefficient is $+0.96$, and a 95% level of confidence. A perfect (concomitant) relationship between two numbers which co-vary would be a linear correlation coefficient of $+1.0$. No relationship would be a linear correlation coefficient of 0.0 . An inverse (negative) relationship in which a high number varies with a low number would be a linear correlation coefficient of -1.0 . A correlation of coefficient of $+0.92$ shows a strong relationship between two variables. The level of confidence means that if we took 100 samples of data, then 95 samples would have valid results; only 5 samples would be subject to error. A 95% level of confidence is typically used a standard to predict human behavior in the social sciences.

³ Federal Highway Administration, Calibration and Adjustment of System Planning Models (Publication No. FHWA-ED-90-015) (No publication place given: December 1990), p. 35.

⁴ The Design Team and The Lafayette Areawide Planning Commission, Lafayette North-South Corridor Study: "Path to Progress" (Lafayette, Louisiana: September, 1993)

Alternative. The alternative not rejected was Alternative No. 3, Evangeline Thruway. The two eastern alternatives (No. 2 and 4) are modeled in this traffic study. The Eastern Alignment is substantially within Lafayette Parish and traverses from south of Verot School Road to East Butcher Switch Road. A section of the Eastern Bypass is shared with the Eastern Alignment, but roughly half of the Bypass is outside of Lafayette Parish. The Eastern Bypass then turns east and connects to the existing portion of I-49 near La Hwy 726.

The third network presented in this report is the RR-4 Alternative as described in the Environmental Impact Statement ⁵ and the book, "The Lafayette I-49 Connector Project" known locally as the "Blue Book", a collaborative publication by the Community Design Workshop of the University of Louisiana - Lafayette and the Lafayette MPO. ⁶ This third alternative utilizes the existing Evangeline Thruway from I-10 Cloverleaf to Second and Third Streets. At that point it veers to the main east/west rail line and traverses parallel to the rail line to Taft Street before continuing and connecting back to the existing Evangeline Thruway near Pinhook Road. The proposed alternative ends at the intersection of Kaliste Saloom Road.

2.0 Demographics

The model utilizes the 2000 census figures plus locally collected 2000 year demographics (such as school attendance) to predict the number of trips produced for each of the 310 internal traffic zones and 35 external traffic zones. Except for employment figures, these demographics are the result of our staff's work using local surveys as well as 2000 census data. The employment figures are an estimate using the 1990 employment figures projected for the year 2000. These employment estimates were made in 1995 by a consultant, Neel-Schaffer Inc., while on contract with DOTD. We in the process of doing a parish wide employment survey at the present. Once completed, these demographic figures will represent a significant investment of our staff time's to collection and verify this data set. Similarly, we are in the process of planning an external trip survey in the next 18 months to estimate traffic entering the study area to update our 1991 external trip survey. In order to estimate external trips, we projected an increase of external traffic using 1% increase per year.

The 2012 demographics are straight line projections of the 2000 year demographics. Each year forward is increased 1.25 % per year for a total increase in each of the demographic variables at a total rate of increase of 15% (12 x1.25). The rate of increase is pro-rated from the Louisiana Department of Transportation and Development estimate for Lafayette Parish population growth for the next 30 years.

⁵ Federal Highway Administration and Louisiana Department of Transportation and Development, I-49 Connector, Lafayette, Louisiana, Final Environmental Impact Statement (No publication place given: August 29 and 30, 2002), Exhibit 2-3C, Schematics Layouts of Alternatives (RR-4 Elevated and RR-5 Elevated).

⁶ Thomas C. Sammons et al, Lafayette I-49 Connector Project, University of Louisiana- Lafayette and Lafayette Consolidated Government Metropolitan Planning Organization: (Lafayette, Spring, 1999)

3.0 Assumptions

Using the demographics, we use a series of equations that predict the number of trips that will leave each zone and then end at each other zone in the parish. The network files uses formulas to calculate the shortest travel time based on the size and capacity of the network as well as the number of trips utilizing each segment of the transportation network. We checked the results of our base year network and demographics to the traffic counting stations.

The modeled capacity and speed on the proposed alignments are equal to the existing capacity and speed of the existing Interstate 10 and 49. The assumed capacity of each alignment is based on a limited access freeway with a total modeled average daily trips of 69,000. Each of the two directions of travel would have a capacity of 34,500. For each direction of travel, there are two lanes, each with a capacity of 17,250 modeled average daily trips. The modeled speed is 60 miles per hour.⁷

The interchanges for each alternative are limited to significant connections along the existing transportation network. The Eastern Alignment has diamond interchanges at south of Verot School Road, Carmel Drive, I-10, and Moss Street. The Eastern Bypass interchanges has diamond interchanges at south of Verot School Road, Carmel Drive, I-10, East Gloria Switch Road, and LA Hwy 726. The interchanges at I-10 (which is now under construction) are modeled as full diamonds in model year 2000. However, the I-10 interchanges in 2012 are modeled as modified split diamonds as the roadway is updated to handle an intersection between interstates.

4.0 Traffic Counting Data

We have collected and then interpolated the DOTD traffic figures from 1985 to 2000. These are actual counts of vehicles which were then seasonally adjusted for an annual period. These numbers are issued about every 2 to 3 years. During the years without a count, we interpolated the values. These figures are the number of vehicles per day that pass at a certain point. We do not know the origin or destination of these trips. We have about 110 DOTD counting stations in the parish of which there are 8 stations along Evangeline Thruway. This data is the standard that we measure the accuracy of our modeling efforts for our base year network. We also use this data standard to check the validity of modeling new roadways for reasonableness as we project our figures forward.

⁷ The proposed RR-4 alternative along the Evangeline Thruway is proposed to be a six lane facility. The reader should note that the project as modeled as a four-lane facility is appropriate in order to match the capacities of the other alternatives, and the four-lane facility is satisfactory to meet demand predicted to be needed in the 12-year period between 2000 and 2012. This approach enables a direct comparison of the various alternatives.

5.0 Verification

Once we ran the base year 2000 scenario which assigned traffic to the base roadway network, we checked the results against the counting station data. This is a procedure to determine if our assumptions embedded in the design of the scenario led to traffic patterns that were not patterns typically found in the network. In fact, this is often the case when an improvement is added and alters traffic flow dramatically, for example, when we added freeways to our transportation network like in this study.

We compared the counting station data along the Thruway for the base 2000 transportation network. We found that the modeled results matched the counting station data with a linear correlation coefficient of +0.92. As such, we exceed the FHWA modeling standards of +0.88.⁸ We also asked ourselves a further question: what chance is the correlation subject to chance? Perhaps the strength of the relationship might be low for the sample size. We performed a Fisher Z transformation test that either predicts a significant relationship not due to chance or a non-significant relationship in which chance may explain the figures. In this case, we found that the relationship is significant.

6.0 Traffic Modeling Results

There were seven sets of traffic data generated in the course of preparing this report. There were three alternatives: Eastern Alignment, Eastern Bypass, and the Evangeline Thruway RR-4 Alternative. For each alternative, traffic predictions were based on two sets of demography: 2000 census demographics and 2012 projected demographics. The 2000 census demographics correspond to the existing 2000 transportation network. Similarly, the 2012 projected demographics corresponds to the 2012 Financially Constrained Transportation Plan (FCTP) network. We thus have three alternatives to be constructed in two demographic years. These six alternatives are then compared to the one year 2000 network to judge their impact.

Each of these alternatives were compared by using four parameters which estimates and quantifies traffic patterns. Two parameters, Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT), are measures of the total network and how efficient an alternative effects network performance. The VMT is the total of all trips occurring on the network throughout the parish. The VHT, similarly, measure the total of travel time for all drivers on the network. A reduction in these parameters generally indicates that the transportation needs are being served with less expenditure of miles traveled and hours traveled. The Modeled Average Daily Trips (MADT) averages the estimated number of trips on an alternative.

⁸ See Footnote 2 for the technical meaning of this value and the level of confidence that was used to generate this figure. See footnote 3 for the citation of modeling standards.

The reader should note that MADT measures trips on the I-49 Connector alternative linking the beginning and end of the project. In contrast, the MADT on Evangeline Thruway is the average of the number of trips found on the existing Thruway as modified by an alternative RR-4 replaces the length of the Evangeline Thruway from Interstate 10 to near Donlon Avenue. However, the remainder of the Evangeline Thruway is preserved in the RR-4 alternative from near Donlon Avenue to its terminus near Surrey Street. The other model alternatives do not modify the Evangeline Thruway.

Table 6.0 Lafayette Metropolitan Planning Organization Comparison of Traffic Patterns for Various Alternatives					
Alternative	Network	Modeled Average Daily Trips (MADT) on I-49 Alternative	Modeled Average Daily Trips (MADT) on Modified Evangeline Thruway ⁷	Vehicle Miles Traveled (VMT) on Entire Network	Vehicle Hours Traveled (VHT) on Entire Network
2000 Base Year	Base	----	46,446	5,776,724	13,511,322
2000 Eastern Bypass	Base	15,926	39,955	5,872,725	12,477,251
2012 Eastern Bypass	FCTP	18,576	43,520	6,750,429	13,702,054
2000 Eastern Alignment	Base	24,716	37,668	5,857,591	12,311,313
2012 Eastern Alignment	FCTP	25,297	41,088	6,735,933	13,540,191
2000 Evangeline Thruway RR-4	Base	58,263	31,128	5,450,723	11,720,915
2012 Evangeline Thruway RR-4	FCTP	66,170	31,985	6,722,581	13,654,363

An analysis of the table allows the following conclusions to be drawn:

(1) For the 2000 demographic year, the most efficient proposed facility is the Evangeline Thruway RR-4 Alternative. Efficiency is defined as a set of facilities which carries more traffic without increasing VMT and VHT. This alternative reduces the VMT from 5,776,724 to 5,450,723 and the VHT from 13,511,322 to 11,720,915. The two other 2000 demographic year alternatives are more than the 2000 base year network. Furthermore, the 2000 Evangeline Thruway RR-4 Alternative reduces the amount of trips on the ground level portion of the Evangeline Thruway the most (31,128) in comparison to the other 2000 demographic alternatives (37,668 and 39,955).

(2) For the 2012 demographic year, The Evangeline Thruway RR-4 Alternative is the most efficient proposed facility. The VMT and the VHT for the 2012 demographic year are nearly equal being approximately 6,700,000 and 13,600,000 for all alternatives. The alternative that moves the most traffic is the Evangeline Thruway RR-4 Alternative which has 66,232 daily trips on the elevated portion of the facility and 31,985 daily trips on the existing ground level roadway. These RR-4 trips total 98,155. This total is significantly more than the trips predicted by the other two

interstate alternatives and the ground level traffic on the Thruway: Eastern Alignment (66,385) and Eastern Bypass (62,096). These totals are excerpted from Table 6.0:

TABLE 6.1 LAFAYETTE METROPOLITAN PLANNING ORGANIZATION 2012 COMPARATIVE TRAFFIC PATTERNS					
Alternative	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Proposed I-49 Alternative Modeled Average Daily Trips	Modified Evangeline Thruway Modeled Average Daily Trips	Total Proposed and Elevated Alternatives Modeled Average Daily Trips
Eastern Alignment	6,735,933	13,540,191	25,297	41,088	66,385
Eastern Bypass	6,750,429	13,702,054	18,576	43,520	62,096
Evangeline Thruway RR-4	6,722,581	13,654,363	66,170	31,985	98,155

The difference in trips between the modeled trips of RR-4 in relation to the Eastern Alignment and the Eastern Bypass is more than 32,000 modeled trips. Some of these trips would necessarily be distributed through the transportation network without increasing the efficiency of the network.

(3) The amount of 2000 and 2012 trips on the facilities decreases from the westernmost alignment (Evangeline Thruway RR-4 Alternative) to the easternmost alignment (Eastern Bypass). One explanation for this distribution is that as one travels away from the central urban core of Lafayette Parish, there are less trips being generated and distributed. As such, the more distant from the central urban core of Lafayette that a facility is constructed, the less trips a facility is likely to carry.

(4) The demographic growth between 2000 and 2012 does not significantly increase the traffic demand for the Eastern Alternative and the Eastern Bypass. However, the traffic demand is slightly more for the RR-4 Alternative. We can excerpt these relationships from Table 6.0 in the table below:

TABLE 6.2 LAFAYETTE METROPOLITAN PLANNING ORGANIZATION COMPARISON OF MODELED AVERAGE DAILY TRAFFIC BETWEEN DEMOGRAPHIC YEARS 2000 AND 2012			
Alternative	Demographic 2000	Demographic 2012	Increase Between 2000 and 2012
Eastern Bypass	15,926	18,576	2,650
Eastern Alignment	24,716	25,297	581
Evangeline Thruway RR-4	58,263	66,170	7,907

The significant changes from 2000 and 2012 is both a demographic increase and a change in transportation networks. The 2000 network contains only the existing transportation system. However, the 2012 network is significantly improved with the Financially Constrained Transportation Plan - FCTP (as described in Section 1.1 Networks). Because the demographic growth is paired with growth in an improved transportation network, the forecasted demand does not significantly increase for these alternatives being modeled.

7.0 More Information

This is a summary of a complex set of calculations and graphic map files. If more data is required, please make a specific request so that we may query our data. Draft 1.0 and subsequent drafts of this report was written and circulated among the staff for comments. The current draft is being submitted to FHWA and DOTD for review and comments.

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